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DISTRIBUTION OF ALKALOIDS IN THE BELLADONNA PLANT.*

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In connection with an investigation of the individual variation of the alkaloidal content of belladonna plants, it was desirable to determine the relative distribution of the alkaloids in the plant. In this article are presented the results of a complete, detailed examination of a number of such individual plants. The conclusions that may be drawn from these results are interesting in that they indicate a number of facts concerning the relative therapeutic value of various parts of the plant which may be of economic significance. Furthermore, a definite knowledge of such a distribution may eventually add to our information concerning the rôle of the alkaloids in the physiological processes of the plant.

In determining the alkaloids it was frequently necessary to assay very small samples. The method employed was that of the U. S. Pharmacopœia with some modifications of the technique to make the process applicable to small samples. These modifications have been described in some previous articles.[1] Analyses were made of first and third year plants.

Third-Year Plants.

The analyses of the third-year plants were made in June, when they were in full bloom. Owing to the fact that most of these were reserved for other work, only four individual plants could be

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[1] *Merck's Report*, August, 1910, p. 215; *Journal of the American Pharmaceutical Assn.*, March, 1912, p. 199.

secured for the experiment, but these four were typical of the entire plot.

The green or aerial portion of each plant was separated into the following parts: (1) Flowers, (2) flowering tops, (3) small and large leaves, and (4) small and large stems. All the parts were immediately weighed so that the percentage of moisture could be determined. The flowers included only the open flowers. The flowering tops consisted of the tops of the branches, including about three or four inches of the young stems and the small and young leaves and flower buds. The small leaves were mostly of the younger growth, located largely near the upper part of the plant; a few, however, growing at the juncture of the old leaves and the stems. The large leaves were picked close to the stem, and the petioles at the base of the leaves were removed and kept separate. The large stems were separated from the small ones, the latter including those above the point where the large stem forks. The small stems as a rule were quite small and tender, averaging about a quarter of an inch in diameter. The large stems were split, the thin bark peeled off, and the pith, which constitutes the bulk of the interior of the stem, was scraped out. Each part was weighed separately.

The roots were carefully dug out and thoroughly washed to remove all dirt. The small roots, which consisted mainly of the young slender ends of the tap roots and secondary fibrous roots, were then separated from the large ones. The large roots, or thick tap roots, were separated into two parts, the wood and the bark.

After being thoroughly air-dried, all parts of the plants were dried to constant weight in a hot-air oven at a maximum temperature of 60 degrees C. The alkaloids were determined by the method described, and the results of the analysis of each of the four plants are shown in Table I, which is summarized at the close, in order to compare the percentages of alkaloids in the several parts of the individual plants.

First-Year Plants.

There were six of the first-year plants, and these were analyzed in September, when the flowering was over and all but a few of the berries were ripe. The ærial portion of each plant was separated into the following parts: (1) Small and large leaves, (2) young sprouts, (3) fruit, (4) small and large stems. The fruits or berries were picked with the stem and calyx attached, the latter being after-

TABLE I.

Analyses of Four Typical Third-year Belladonna Plants.

Plant and part	Weight (grams)		Moisture per cent.	Per cent. of entire plant	Alkaloids		
	Green	Dry			Grams	Per cent.	Percentage of quantity of alkaloids in the plant
Plant No. 1.							
Flowers	34.15	5.75	83.17	2.14	0.0255	0.445	2.27
Flowering tops	194.20	31.94	83.57	11.86	.2753	.862	24.42
Leaves:							
Small	40.36	7.55	82.68	2.81	.0512	.679	4.54
Large:							
Without petioles	187.44	31.04	83.42	11.56	.1173	.378	10.40
Petioles	28.94	2.89	90.00	1.07	.0110	.381	.97
Entire large leaves	216.38	33.93	84.30	12.60	.1283	.378	11.37
Total	256.74	41.48	83.70	15.70	.1795	.432	15.90
Stems:							
Small	161.65	20.33	87.40	7.55	.0896	.441	7.93
Large:							
Pith	141.80	10.00	92.95	3.71	.0337	.337	2.98
Bark	95.20	10.76	87.93	3.99	.0131	.128	1.16
Wood	113.00	27.81	75.45	10.33	.0292	.105	2.59
Entire large stems	350.00	48.57	86.10	18.04	.0760	.156	6.73
Total	511.65	68.90	86.58	25.59	.1656	.237	14.66
Roots:							
Small	85.95	13.81	83.92	5.13	.0701	.508	6.22
Large:							
Wood	473.30	64.35	86.42	23.90	.2786	.433	24.72
Bark	271.70	42.95	84.20	15.95	.1331	.310	11.81
Entire large roots	750.00	107.30	85.60	39.88	.4117	.383	36.53
Total	835.95	121.21	85.40	45.01	.4818	.398	42.75
Entire plant	1,832.69	269.28	85.31	.....	1.1277	.418	100.

TABLE I.—*Continued.*

Analyses of Four Typical Third-year Belladonna Plants.

Plant and part	Weight (grams)		Moisture per cent.	Per cent. of entire plant	Alkaloids		
	Green	Dry			Grams	Per cent.	Percentage of quantity of alkaloids in the plant
Plant No. 2.							
Flowers	26.67	4.55	82.95	2.04	.0126	.277	1.21
Flowering tops	111.55	16.63	85.08	7.50	.1280	.770	12.33
Leaves:							
Small	21.00	2.95	86.00	1.32	.0181	.613	1.72
Large:							
Without petioles	183.00	27.23	85.14	12.20	.1555	.571	14.96
Petioles	21.65	2.32	89.30	1.04	.0194	.839	1.87
Entire large leaves	214.65	29.55	86.10	13.24	.1749	.592	16.85
Total	235.65	32.50	86.08	14.64	.1930	.597	18.57
Stems:							
Small	141.70	18.48	86.93	8.28	.1417	.767	13.63
Large:							
Pith	120.90	9.34	92.27	4.18	.0347	.372	3.34
Bark	82.30	9.50	88.45	4.17	.0145	.153	1.345
Wood	93.00	25.07	73.00	11.23	.0326	.130	3.14
Entire large stems	296.20	43.91	85.20	19.67	.0818	.186	7.88
Total	437.90	62.39	85.80	27.95	.2235	.358	21.51
Roots:							
Small	105.50	16.47	84.40	7.38	.0974	.592	9.36
Large:							
Wood	364.30	53.71	85.32	24.07	.2572	.479	24.75
Bark	266.70	36.93	86.07	16.59	.1274	.345	12.27
Entire large roots	630.00	90.64	85.61	40.61	.3846	.424	37.02
Total	735.50	107.11	85.44	52.52	.4820	.450	46.38
Entire plant	1,538.27	223.18	85.49	.....	1.0391	.466	.....

TABLE I.—*Continued.*

Analyses of Four Typical Third-year Belladonna Plants.

Plant and part	Weight (grams)		Moisture per cent.	Per cent. of entire plant	Alkaloids		
	Green	Dry			Grams	Per cent.	Percentage of quantity of alkaloids in the plant
Plant No. 3.							
Flowers	29.75	5.26	82.30	2.03	.0191	.366	1.58
Flowering tops	104.00	16.29	84.32	6.29	.1379	.847	11.38
Leaves:							
Small	28.00	4.57	83.70	1.77	.0305	.669	2.51
Large:							
Without petioles	186.83	28.36	84.88	10.95	.1273	.449	10.50
Petioles	18.67	1.69	90.99	.65	.0059	.354	.49
Entire large leaves	205.50	30.05	85.40	11.60	.1332	.443	10.99
Total	233.50	34.62	85.10	13.29	.1637	.472	13.50
Stems:							
Small	125.80	17.49	86.08	6.75	.0892	.510	7.36
Large:							
Pith	119.30	7.24	93.49	2.80	.0222	.307	1.83
Bark	84.60	7.98	9035.	3.08	.0113	.142	.93
Wood	98.50	26.86	72.70	10.37	.0306	.114	2.53
Entire large stems	302.40	42.08	86.13	16.24	.0641	.152	5.29
Total	428.20	59.57	86.10	22.99	.1533	.257	12.65
Roots:							
Small	212.80	36.33	82.97	14.03	.2365	.651	19.51
Large:							
Wood	449.90	70.54	84.30	27.23	.3900	.553	32.19
Bark	216.10	36.40	83.20	14.05	.1114	.306	9.19
Entire large roots	666.00	106.94	83.93	41.29	.5014	.469	41.38
Total	878.80	143.27	83.70	55.31	.7379	.515	60.89
Entire plant	1,674.25	259.01	84.53	.....	1.2119	.468	.....

TABLE I.—*Continued.*

Analyses of Four Typical Third-year Belladonna Plants.

Plant and part	Weight (grams)		Moisture per cent.	Per cent. of entire plant	Alkaloids		
	Green	Dry			Grams	Per cent.	Percentage of quantity of alkaloids in the plant
Plant No. 4							
Flowers	41.60	8.00	80.60	2.83	.0361	.452	3.00
Flowering tops	91.00	16.37	82.00	5.79	.1607	.982	13.36
Leaves:							
Small	28.60	5.00	81.40	1.77	.0378	.757	3.14
Large:							
Without petioles	185.50	30.48	83.60	10.79	.1026	.337	8.53
Petioles	18.60	1.62	91.30	.57	.0081	.502	.68
Entire large leaves	204.10	32.10	84.24	11.36	.1107	.345	9.21
Total	230.90	37.10	83.75	13.13	.1485	.400	12.35
Stems:							
Small	195.60	22.50	88.50	7.96	.1597	.710	13.28
Large:							
Pith	140.20	10.37	92.60	3.67	.0431	.416	3.59
Bark	118.00	12.31	89.58	4.63	.0136	.111	1.13
Wood	138.30	38.29	73.30	13.55	.0486	.127	4.03
Entire large stems	396.50	60.97	84.65	21.58	.1053	.173	8.75
Total	592.10	83.47	85.95	29.54	.2650	.318	22.03
Roots:							
Small	196.20	35.65	81.80	12.62	.1750	.491	14.55
Large:							
Wood	415.30	63.62	84.75	22.52	.3047	.479	25.33
Bark	229.30	38.34	83.30	13.57	.1127	.294	9.38
Entire large roots	644.60	101.96	84.20	36.08	.4174	.409	34.71
Total	840.80	137.61	83.61	48.70	.5924	.430	49.26
Entire plant	1,796.40	282.55	84.27	.....	1.2027	.425	.....

TABLE II.

Comparison of Percentage of Alkaloids in Different Parts of Plants.

Part of plant	Alkaloids (per cent.)					
	Plant No. 1	Plant No. 2	Plant No. 3	Plant No. 4	Average of 4 plants	Fraction of average total alkaloids in 4 plants
Flowers	0.445	0.277	0.366	0.452	0.385	2.03
Flowering tops	.862	.770	.847	.982	.865	15.33
Leaves:						
Small	.679	.613	.669	.757	.679	3.00
Large:						
Without petioles	.378	.671	.449	.337	.434	10.98
Petioles	.381	.839	.354	.502	.769	.93
Entire large leaves	.378	.592	.443	.345	.439	11.94
Total	.432	.597	.472	.400	.475	14.95
Stems:						
Small	.441	.767	.510	.710	.607	10.48
Large:						
Pith	.337	.372	.307	.416	.358	2.97
Bark	.128	.153	.142	.111	.134	1.17
Wood	.105	.130	.114	.127	.119	3.13
Entire large stems	.156	.186	.152	.173	.167	7.27
Total	.237	.358	.257	.318	.292	17.62
Roots:						
Small	.508	.592	.651	.491	.561	12.63
Large:						
Wood	.433	.479	.553	.479	.486	26.86
Bark	.310	.345	.306	.294	.314	10.58
Entire large roots	.383	.424	.469	.409	.421	37.44
Total	.398	.450	.515	.430	.448	50.07
Entire plant	.418	.466	.468	.425	.444	.....

ward detached and kept separate. The berries were allowed to dry slowly in the air until the seeds and husks could be separated. The young sprouts, which were found mainly along the lower portions of the large stems, were from 2 to 4 inches long and consisted of tender growth of stem and leaves. Since these were first-year plants all the stems were rather small and none were large enough to be

TABLE III.

Analyses of Six Typical First-year Belladonna Plants.

Plant and part	Weight (grams)		Moisture per cent.	Per cent. of entire plant	Alkaloids		
	Green	Dry			Grams	Per cent.	Percentage of total quantity in the plant
Plant No. 1							
Leaves	134.00	27.56	79.40	12.23	.1463	.531	21.67
Small	78.35	15.94	79.70	7.07	.0906	.569	13.42
Large	55.65	11.62	79.10	5.16	.0557	.479	8.25
Young sprouts	58.20	8.50	85.50	3.77	.0680	.799	10.07
Fruit	350.40	67.35	80.00	29.90	.1816	.269	26.90
Calyx	72.65	9.95	86.40	4.42	.0084	.085	1.24
Berries	277.75	57.40	79.40	25.50	.1732	.302	25.66
Seeds	.....	44.59	....	19.86	.1536	.344	22.75
Husks	.....	12.81	.....	5.64	.0196	.153	2.91
Stems	352.80	76.68	78.40	34.05	.0752	.098	11.14
Small	181.30	40.72	77.40	18.20	.0493	.121	7.30
Large	171.50	35.96	79.00	15.93	.0259	.072	3.84
Roots	215.80	47.17	78.00	20.94	.2040	.432	30.22
Entire plant	1,111.20	225.26	79.70	.....	.6751	.299	.....
Plant No. 2							
Leaves	83.40	18.38	77.9	10.05	.1137	.619	18.03
Small	41.65	9.09	78.3	4.97	.0594	.654	9.42
Large	41.75	9.29	77.6	5.08	.0543	.586	8.61
Young sprouts	59.50	6.59	83.2	3.60	.0629	.953	9.98
Fruit	245.70	54.20	78.5	29.78	.1960	.361	31.08
Calyx	60.55	8.32	79.8	4.58	.0126	.152	1.49
Berries	185.15	45.88	75.3	25.20	.1834	.399	29.09
Seeds	.....	33.76	.....	18.55	.1618	.479	25.65
Husks	.....	12.12	.....	6.65	.0216	.178	3.43
Stems	361.15	66.63	81.3	36.50	.0788	.118	12.49
Small	198.00	35.79	82.1	19.60	.0566	.158	8.97
Large	163.15	30.84	81.0	16.90	.0222	.072	3.52
Roots	167.90	36.70	78.1	20.07	.1793	.488	28.42
Entire plant	897.65	182.5	79.7	.....	.6307	.346	.....

TABLE III.—*Continued.*

Analyses of Six Typical First-year Belladonna Plants.

Plant and part	Weight (grams)		Moisture per cent.	Per cent. of entire plant	Alkaloids		
	Green	Dry			Grams	Per cent.	Percentage of total quantity in the plant
Plant No. 3							
Leaves	107.57	25.44	76.40	11.28	.1305	.514	20.06
Small	70.40	16.56	76.40	7.33	.0907	.548	13.94
Large	37.17	8.88	76.00	3.95	.0398	.448	6.12
Young sprouts	46.95	8.04	82.90	3.56	.0708	.877	10.87
Fruit	337.40	66.83	80.10	29.63	.2014	.302	30.93
Calyx	77.45	10.72	86.00	4.73	.0091	.085	1.39
Berries	259.95	56.11	78.30	24.90	.1923	.343	29.54
Seeds	.....	44.25	.....	19.64	.1733	.391	26.61
Husks	.....	11.86	.....	5.26	.0190	.160	2.92
Stems	363.50	77.03	79.00	34.15	.0564	.073	8.66
Small	154.10	31.93	78.00	14.15	.0298	.093	4.58
Large	209.40	45.10	78.50	20.00	.0266	.059	4.08
Roots	197.15	48.23	75.50	21.38	.1920	.397	29.48
Entire plant	1,052.57	225.57	78.60	.....	.6511	.288	.....
Plant No. 4							
Leaves	142.30	27.59	80.70	10.45	.2038	.736	20.37
Small	68.65	13.13	81.00	4.95	.0918	.698	9.17
Large	73.65	14.46	80.40	5.50	.1120	.772	11.20
Young sprouts	51.92	8.21	84.20	3.12	.0849	1.032	8.49
Fruit	398.80	75.34	81.05	28.56	.2810	.373	28.09
Calyx	109.45	13.90	87.10	5.28	.0294	.211	2.94
Berries	289.35	61.44	78.80	23.28	.2516	.409	25.15
Seeds	.....	49.20	.....	18.66	.2170	.441	21.69
Husks	.....	12.24	.....	4.62	.0346	.283	3.46
Stems	400.05	82.63	79.20	31.32	.1156	.140	11.55
Small	183.10	36.93	78.60	14.00	.0661	.179	6.60
Large	216.95	45.70	78.90	17.32	.0495	.108	4.95
Roots	238.35	70.00	70.90	26.55	.3150	.450	31.50
Entire plant	1,231.77	263.77	78.30	.....	1.0003	.379	.....

TABLE III.—*Continued.*

Analyses of Six Typical First-year Belladonna Plants.

Plant and part	Weight (grams)		Moisture per cent.	Per cent. of entire plant	Alkaloids		
	Green	Dry			Grams	Per cent.	Percentage of total quantity in the plant
Plant No. 5							
Leaves	113.75	23.41	82.20	12.69	.2135	.913	28.67
Small	60.05	12.51	79.10	6.80	.1113	.890	14.94
Large	53.70	10.90	79.80	5.89	.1022	.938	13.73
Young sprouts	51.95	7.52	85.50	4.10	.0790	1.052	10.62
Fruit	295.60	58.72	80.08	31.99	.1957	.333	26.27
Calyx	75.06	9.69	86.90	5.27	.0148	.221	1.99
Berries	220.60	49.03	77.80	26.72	.1809	.370	24.28
Seeds	.....	37.80	.....	20.65	.1550	.409	20.81
Husks	.....	11.14	.....	6.07	.0259	.233	3.47
Stems	331.75	62.13	81.10	33.84	.0892	.144	11.98
Small	192.05	35.30	81.80	19.22	.0626	.177	8.41
Large	139.70	26.83	80.90	14.62	.0266	.099	3.57
Roots	126.50	31.90	73.90	17.38	.1674	.524	22.46
Entire plant	919.55	183.68	81.98	.....	.7448	.405	.....
Plant No. 6							
Leaves	107.65	20.72	80.70	10.04	.1662	.803	23.65
Small	57.40	10.97	80.89	5.31	.0873	.794	12.42
Large	50.25	9.75	80.59	4.73	.0789	.808	11.23
Young sprouts	37.55	6.21	83.25	3.01	.0545	.876	7.75
Fruit	335.85	61.29	81.50	29.69	.1700	.277	24.19
Calyx	80.15	9.50	88.10	4.60	.0132	.139	1.88
Berries	255.70	51.79	79.70	25.09	.1568	.305	22.31
Seeds	.....	37.28	.....	18.06	.1193	.320	16.97
Husks	.....	14.51	.....	7.03	.0375	.259	5.38
Stems	380.70	70.67	81.40	34.23	.0874	.114	12.44
Small	244.00	43.32	82.00	21.00	.0724	.167	10.30
Large	136.70	27.35	79.90	13.23	.0150	.055	2.14
Roots	221.50	47.54	78.30	23.03	.2247	.472	31.97
Entire plant	1,083.25	206.43	80.94	.....	.7028	.340	.....

separated into bark, wood, and pith. The roots also were much smaller than in the older plants and were therefore not separated into large and small roots.

In assaying the seeds it was necessary first to extract the fixed oil with petroleum ether. The percentage of alkaloids, however, as given in Table III, is calculated on the basis of the whole seeds.

TABLE IV.

Summary Showing Comparison of Percentages of Alkaloids in Different Parts of the Six Plants.

Part of plant	Alkaloids (per cent.)							
	Plant No. 1	Plant No. 2	Plant No. 3	Plant No. 4	Plant No. 5	Plant No. 6	Average of all plants	Fraction of average total alkaloids in 6 plants
Leaves	0.531	0.619	0.514	0.736	0.913	0.803	0.6860	22.10
Small	.569	.654	.548	.698	.890	.794	.6922	12.05
Large	.479	.586	.448	.772	.938	.808	.6718	10.05
Young sprouts	.799	.953	.877	1.032	1.052	.876	.9315	9.53
Fruit	.269	.361	.302	.373	.333	.277	.3192	27.84
Calyx	.085	.152	.085	.211	.221	.139	.1488	1.99
Berries	.302	.399	.343	.409	.370	.305	.3572	25.85
Seeds	.344	.479	.391	.441	.409	.320	.3973	22.25
Husks	.153	.178	.160	.283	.233	.259	.2110	3.60
Stems	.098	.118	.073	.140	.144	.114	.1145	11.41
Small	.121	.158	.093	.179	.177	.167	.1492	7.65
Large	.072	.072	.059	.108	.099	.055	.0775	3.76
Roots	.432	.488	.397	.450	.524	.472	.4605	29.11
Entire plant	.299	.346	.288	.379	.405	.340	.3430	

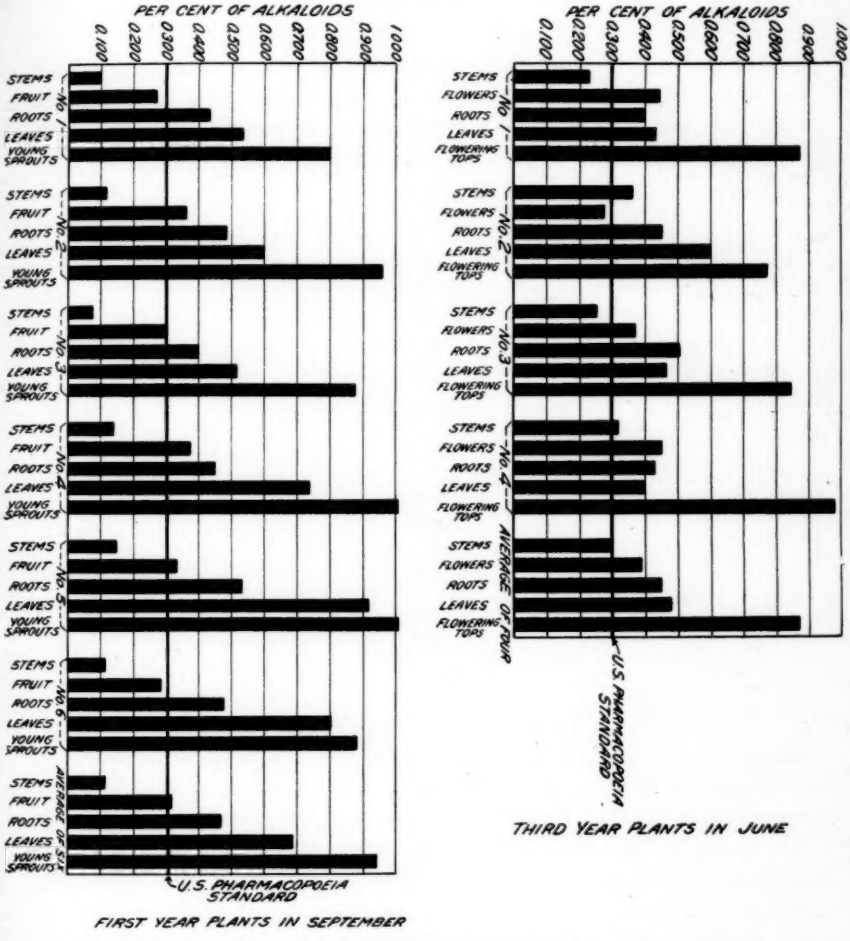
A critical review of Tables I to IV leads to the conclusion first of all that in a general way the distribution of alkaloids in the different parts of belladonna plants is largely the same in different individual plants. While it is probably unwise to draw definite conclusions from the limited number of plants here analyzed, the results are without doubt largely indicative of what would be found were analyses made of many more plants. Gerard [2] has found that in both wild and cultivated belladonna plants the leaves, roots, fruit,

[2] Gerard, A. W. Report on the alkaloidal value of cultivated and wild belladonna plants, *Yearbook of Pharmacy*, 1880–1881, pp. 482–489.

and stems rank in the order named as regards the percentage of alkaloidal content. These observations are in perfect accord with the results here given. A number of interesting facts are emphatically brought out. Of the ærial part of the plant all parts but the large woody stems contain enough alkaloids to make their utilization practicable. During the early summer, belladonna herb, including leaves, tops, and small stems, could be advantageously picked as far as medicinal strength is concerned if the herb rather than leaves were official. The flowering tops in the third-year plants easily rank first as containing the greatest percentage of alkaloids. In all the first-year plants, the young sprouts are found to contain the greatest quantity of alkaloids, two of the six containing more than 1 per cent. Attention has been directed to the fact that the flowering tops and the young sprouts represent the youngest and tenderest growth in the third-year and in the first-year plants, respectively. Since in the plants analyzed the greatest concentration of alkaloids is found in these parts, the logical conclusion is that the greatest concentration of alkaloids is to be found in the youngest parts of the plants. A further study of the tables will emphasize this fact still more. In seven of the ten plants the small leaves are considerably richer in alkaloids than the large leaves, the average for the small leaves being 0.687 per cent. and for the large ones 0.578 per cent. The small leaves usually appear on the plants later than the large ones. In the case of the third-year plants, which were analyzed in June, the small leaves were found mostly near the tops of the branches, indicating that they represented younger growth than the large leaves. Later in the season there is always a preponderance of small leaves, very little growth of large leaves taking place after the flowering period is over. Hence, in all the plants under consideration, the small leaves constitute in a general way younger growth than the large ones. The higher percentage of alkaloids in the former is, therefore, parallel to the condition that exists in the flowering tops and young shoots. Again it is seen that the same is true of the stems. The average per cent. of alkaloids in the small stems is 0.332, and in the large stems 0.113. The difference is especially marked in the third-year plants. Here again those stems which constitute the youngest growth are richest in alkaloids. In the four plants where the large and small roots were separated, the average alkaloidal content of the small roots was 0.561 per cent., and of the large roots 0.421 per cent. The small roots, as has been

stated, consisted mostly of the young and tender ends of the tap roots. The relationship is again evident. In the four third-year plants whose large stems and roots were separated into their various

FIG. 1.



Graphic illustration showing the distribution of the alkaloids in the various parts of the Belladonna plant.

parts, the average per cent. of alkaloids is as follows: Pith of stems, .0358; bark of stems, 0.134; wood of stems, 0.119; bark of roots, 0.314; wood of roots, 0.486. Figure I shows graphically the distribution of alkaloids in the plant.

It has been quite generally held that most of the alkaloids in the roots are found in the bark. The National Dispensatory states that a good root contains alkaloids in the parenchymal tissue of all parts though mostly in the bark, while in a woody root it is almost exclusively in the bark. This investigation appears to indicate that such is not always the case. In all of the four three-year old plants analyzed, the woody part of the roots was richer in alkaloids than the bark. In order to obtain further data on this question, seven four-year old plants were dug up early in the fall and the roots separated into bark and wood. Table V shows the results of the assays.

TABLE V.

Comparison of Alkaloidal Content of the Bark and Wood of the Roots of Individual Belladonna Plant.

Number of plant	Alkaloids (per cent.)	
	Bark	Wood
1	0.182	0.217
2	0.163	0.177
3	0.262	0.324
4	0.144	0.290
5	0.205	0.347
6	0.238	0.447
7	0.227	0.400

These results show further that the bark is not always richer in alkaloids than the woody tissue.

It has been pointed out that the small leaves were found to be almost invariably richer than the large leaves. This is a matter of some importance in that it becomes a factor in the method of picking leaves with regard to securing those of greatest medicinal value. To establish this fact more conclusively, large and small leaves were picked from the individual belladonna plants. At the same time leaves were also picked from a number of species of Datura. Table VI shows the relative percentage of alkaloids in the leaves.

It will be noticed that in only one instance, plant No. 2, does the sample of large leaves show a greater percentage of alkaloids than the smaller. In all the others the difference is greatly in favor of the small leaves, as is also indicated by the averages. All but one of the *Datura* species indicated the same condition, thus showing

that the relative concentration of alkaloids in large and small leaves, as found in belladonna, exists also in other members of the solanaceous family. Since the small leaves are as a rule younger than the large ones, it would seem that the greater concentration of alkaloids in the former is due to greater cell activity. It would be expected that there would be a general graduation in the concentration of alkaloids from the youngest to the oldest leaves. To determine this point two rows each containing about 75 plants were selected. From

TABLE VI.

Comparison of Alkaloidal Content of Large and Small Leaves from Individual Plants of Atropa Belladonna and Various Species of Datura.

Plant analyzed	Alkaloidal content of leaves (per cent.)		Plant analyzed	Alkaloidal content of leaves (per cent.)	
	Large	Small		Large	Small
Atropa belladonna:			Datura stramonium	0.268	0.418
Plant No. 1	0.342	0.657	D. fastuosa No. 29646	.438	.478
Plant No. 2	.743	.706	D. gigantea	.165	.179
Plant No. 3	.685	.915	D. quercifolia	.228	.368
Plant No. 4	.840	.929	D. fastuosa No. 29644	.423	.479
Plant No. 5	.864	.904	D. stramonium inermis	.221	.511
Plant No. 6	.718	.831	D. tatula	.218	.241
Plant No. 7	.537	.723	D. tatula inermis	.277	.271
Plant No. 8	.960	1.074	D. leichardti	.175	.189
Plant No. 9	.775	.924	D. inermis (red stem)	.190	.454
Plant No. 10	.570	.990	D. stramonium (red stem)	.176	.381
			D. inermis	.133	.475
			D. metaloides	.306	.441
Average	.703	.865	Average	.247	.378

each row 8 samples of leaves were picked, ranging from the smallest to the largest. Each sample was taken from the entire row so that leaves from all the plants were included. By this means, the factor of individual plant variation was eliminated as much as possible. The following table shows the per cent. of alkaloids in each sample.

In row No. 1 the average of the first and last four samples are 0.639 and 0.308 per cent., respectively, while in row No. 2 the averages are 0.695 and 0.402, respectively. It is evident that if too many of the larger leaves are included the sample will assay relatively low and will hardly give a fair indication of the value of the plant. There is a natural tendency to pick such leaves because they can be more

TABLE VII.

Comparison of Alkaloidal Content of Belladonna Leaves, Varying in Size from the Smallest to the Largest, each Sample being a Collective Picking from the Entire Row.

Row No. 1.		Row No. 2.	
Sample	Alkaloids (per cent.)	Sample	Alkaloids (per cent.)
1 (smallest)	0.621	1 (smallest)	0.598
2	0.706	2	0.700
3	0.664	3	0.669
4	0.766	4	0.804
5	0.598	5	0.605
6	0.406	6	0.523
7	0.110	7	0.324
8 (largest)	0.116	8 (largest)	0.212

rapidly picked owing to their size. It is economically out of the question to pick such leaves as constitute samples 1 and 2, while samples 3 to 6 should represent the best leaves available for all purposes, appearance as well as strength, and from both the medicinal and commercial standpoint.

THE VOLATILE NATURE OF THE TOXIC CONSTITUENT OF POISON IVY.

BY CHARLES E. BESSEY.

There is a pretty general agreement among medical men that the active poisonous principle in Poison Ivy (*Rhus radicans* L., *Toxicodendron radicans* (L.) Kuntze) is a non-volatile oil, and that as a consequence poisoning without contact is impossible. Yet there are many assertions to the contrary by those who have been victims of this poisonous principle. I have heard persons assert that they had been poisoned when walking or driving by the Poison Ivy. I have always maintained a feeling of considerable doubt in regard to such cases, for it is obviously difficult to prove lack of contact.

However, I myself once suffered from a severe case of poisoning without contact, as I reported a few years ago in a paper entitled "A Preliminary Account of the Plants of Nebraska which are

Reputed to be Poisonous, or are Suspected of Being So," and published in the *Annual Report of the Nebraska State Board of Agriculture* for 1901. This account is so detailed that I repeat it here, as follows:

"An assistant brought into my laboratory a tin box full of plants, among which were many flowering specimens of the Poison Ivy. The day was hot, and the assistant had walked in the sun for a mile or more, in bringing in the plants. Knowing my susceptibility to Poison Ivy poisoning he warned me not to touch the tin box or its contents. I therefore told him to open the box while I looked on and selected the plants which I wished him to preserve for pressing. As the box was opened I leaned over and looked in, being very careful not to come into contact with the box or the plants. As the assistant took up plant after plant I pointed to others and asked him in regard to the stations where he secured them. I was very careful, as I had been very severely poisoned many times before, and did not wish to have another experience of the discomfort. Yet in a day or two I found myself suffering with the usual inflammation, only the surfaces affected were those only which had been directly exposed when I leaned over the box of plants. My face was inflamed all over, except where my beard, mustache, eyebrows, and nose made projecting protections. Above these there were small areas entirely free from inflammation. The under side of my eyebrows (the 'overhang') was thoroughly poisoned, and so was the inside of my nose (the nostrils). My right hand was severly poisoned, but here again the distribution of the inflammation was peculiar, being confined to the parts which were *directed downward* as I pointed at the various specimens in the box. Thus the proximal and middle joints of the second, third and fourth fingers, and the under side of the wrist of that hand were badly affected, while the upper side of the hand was not poisoned at all. My left hand was not poisoned, and I account for this by the fact that it was kept back and not used in indicating plants to be examined by the assistant."

I do not see how any one can escape from the conclusion that that which poisoned me so severely and so peculiarly was volatile enough to be carried up (apparently in straight lines) in the warm air which escaped from the tin collecting box (vasculum) when opened in my study. In this case there was no contact on my part with the Poison Ivy, nor with any other plants in the vasculum. I

had been poisoned too often to be careless when warned by my assistant. I am not denying the truth of Dr. Pfaff's conclusion that there is a non-volatile poisonous oil in the Poison Ivy. I am forced to conclude that there is a volatile poison, also, in this plant.

THE UNIVERSITY OF NEBRASKA.

APPLIED PHARMACOGNOSY.

SOME OBSERVATIONS OF A GRADUATE.

BY J. R. RIPPETOE.

What are you going to do one year from to-day or what will you be doing? You don't know, certainly not. If it were possible for you to know, wouldn't you prepare to make that day's work a success?

Did it ever occur to you to try and imagine what kind of a world this would be if every man could begin at his deathbed and live life back to birth or in other words live his life over again with the advantages of the experience and knowledge gained in his lifetime? Old age says my days have passed but youth is full of ambition and hopes for the future.

The laws of nature give man only one life but the law of evolution gives youth all the advantages of the experience of old age. We, therefore, in our lifetime take from the present and the past varying portions of its offerings.

You are now learning the principles of Pharmacy and soon you will be as fully equipped as the learned professors and instructors in this college can teach you and as much as you are willing to learn.

The point I want to take up with you is the application of your knowledge. Some of you will, no doubt, take up manufacturing pharmacy. Those of you who will take up retail pharmacy will find my remarks equally applicable to your position.

What are the duties of a pharmacist or a pharmaceutical chemist in a pharmaceutical laboratory?

The first operation is the writing of a working formula. If an official preparation is to be made this is not difficult, but I have seen some men spend several hours in trying to calculate the quantities of each ingredient when the formula may be given to them for one fluidounce or one tablet, as the case may be, and even then

not have it correct. A formula may state the grains or minims in each fluidounce and for practical purposes it must be calculated to the proper quantities to make 100 liters.

As many liquids are bought and sold by weight and it is also more practical to handle them by weight the minims must be converted into grammes and kilos. The specific gravity of the liquids, therefore must also be considered. Calculating many liquids to weight is absolutely necessary for figuring costs.

The quantity to be made is primarily governed by the demand but there is to be considered among other things cost of raw material. This is particularly to be considered with crude drugs which at times offer about as much opportunity for speculation as stocks in Wall Street. With such drugs as ergot, jalap, ipecac, hydrastis and opium varying in price from 50 cents to $10.00 per pound and the price fluctuating with the season or crop it is necessary to keep an eye on the market and your stock and sales.

The buying of crude material and selling of the finished products are of course taken care of by separate departments, but the manufacturing comes in between and requires some knowledge of the buying and selling. The buying and selling departments offer good inducements to college trained men, the selling in particular to men who are more inclined to the commercial side rather than the scientific side of pharmacy.

If a fluidextract or some drug preparation is to be made and there is no stock of crude drug on hand the purchase of drug is taken up with the buying department. The buying department asks for quotations and samples of the drug offered, especially if the drug is one that has some official standard. The samples are carefully examined for freedom from foreign drugs and assayed for alkaloidal or extractive content.

The analytical reports are compared and the price also taken into consideration for selecting the lot of drug to be purchased. With assayed drugs for example the price may not vary very much but the alkaloidal content may vary as much as 100 per cent.

Since most drug preparations are made by extracting the drug with an alcoholic menstruum varying in strength from 10 to 95 per cent. absolute alcohol, and alcohol costs about $2.50 per gallon by the barrel, means must be employed for carrying out the operations to prevent loss in handling, evaporation and final recovery from the exhausted drug.

All liquids are best handled by allowing them to flow from one vessel to another by gravity or by means of pumps to produce both pressure and vacuum as may be required.

Ofttimes it is necessary to carry out a number of experiments to determine the best combination of alcohol and water, and sometimes with glycerin or acid added, to extract the desirable constituents.

In the making of pills and tablets, excipients or the proper liquid for granulating the ingredients are to be considered. This requires a knowledge of the properties of the ingredients. In making tablets the ingredients may be granulated by adding water, alcohol, ether, chloroform, petroleum benzin, other volatile liquids or combinations of these.

Many formulas that are official in the U. S. P. or N. F. are practical for small quantities or immediate use but for large quantities and indefinite future use are not always satisfactory. The U. S. P. permits modification of the methods providing the finished products do not differ in their properties. Therefore, even in the official preparations, we have numerous problems for investigation. Elixir Iron, Quinine and Strychnine Phosphates U. S. P. is a splendid example of the manufacturers' problems and for that matter the retail druggist also. Every issue of the various drug Journals brings forth some new suggestion until it seems every one must have a different method for making it.

Elixirs or similar preparations are very popular as a means for administering most any drug and I might say whether it has merits or not. They are often very troublesome to make. Prior to the Food and Drugs Act and even now, in some few cases everything seemed to be sacrificed for elegance in appearance, color, flavor, etc., and the ingredients claimed to be present were conspicuous by their abscence excepting in the very imposing gun-shot formula upon the label.

The pharmacist in filling a prescription can excuse his or the physician's unintended precipitating mixtures by putting on a " shake well " label but not so with the pharmaceutical manufacturer. Only clear non-precipitating preparations can be sent out, and there must not be any changing in color and ofttimes druggists expect them to stand storage in zero temperature and serve for a window display in a window subject to the sun's rays throughout the day.

We must, therefore, consider the solubility, stability, incom-

patibility or means for controlling any one or all of these properties of each and every ingredient in the preparation. And last but not least the color and flavor must be pleasing to the eye and taste.

It is these characteristics, the last two in particular, that have built up the pharmaceutical manufacturer's business at the expense of the druggist, and the physician's ability as a prescription writer.

You might think the manufacturer has his formulas all highly perfected and there is nothing more to be done. This is not always the case. Purer chemicals are produced, solubilities and incompatibilities may be changed or some new procedure of manipulation is learned. We therefore have before us a continual line of substances and preparations for research.

If a new or modified formula is to be made up it is always advisable to make up a small quantity, taking note of each step and carefully observing just what reactions take place. Possibly a number of combinations are indicated and about the only way to prove their value is to make up the combinations and test them out under all conditions. Each lot may be divided into portions and one of each placed in the sunlight, a hot closet, an ice box, humid atmosphere and a control under normal conditions.

When the satisfactory combination is decided upon, the manipulation and apparatus for handling large quantities is to be considered.

Means for weighing and measuring, mixing, mechanical apparatus, kettles for heating, filtering, storage, bottling or filling packages are problems always to be solved. Since the difference between raw material and finished product is labor, practical apparatus and economical manipulation stand between profit and loss.

After the preparation is finished and ofttimes during the operation various assays are made to check up the process, also for standardized preparations which are usually made overstrength and adjusted by assay. Fluidextracts, elixirs, syrups, etc., are assayed for alcohol, alkaloids, extractive, specific gravity; tablets and pills for weight and ingredients; ointments for grittiness, also powders; emulsions for efficiency of emulsification, etc.

As the majority of men seeking employment in a pharmaceutical laboratory prefer to get into the analytical department I want to say a few words about the work. I don't mean to be sarcastic or to ridicule any one, but I want to point out to you the problems by telling you how they should not be done.

I trust that every student in this audience will receive his diploma at the appointed time. We occasionally meet students who go to college for a diploma and not an education. I recall a classmate of mine who took his freshmen year in this college and did not show up again until the senior year. He stated that he had spent his junior year in another college taking a Ph.G. degree and by returning here for the senior year would receive another degree. Possibly a man with as much ability to corner the market in degrees will succeed in his own way.

Many graduates seem to think that with commencement study ends. If that is the way you feel about it you want to change your future plans at once.

I recall a former analytical assistant of mine who considered attending pharmaceutical and chemical association meetings and the reading of journals a waste of time. His work was typical of his knowledge.

Upon asking him why he ignited a tablet, which had been given him to test for morphine, he replied that he was going to test the ash for the morphine. When told he was not getting the results he should in making a preparation he stated that he had not studied it in college. If I felt that way about my work I would have to stay in college the balance of my life.

One of the most essential things in your work is several good drug journals and if interested in chemistry a journal on chemistry also. They are absolutely necessary if you want to keep abreast of the times. You may have plenty of ideas of your own to keep you busy but the other fellows have some too and unless you take advantage of the new discoveries that are being announced every day it won't be many years until you will find yourself surrounded by cobwebs of a vintage of the year you graduated.

Some men will say I haven't the time to read journals or I haven't the money. Membership in the American Pharmaceutical Association is $5.00 a year and the best drug Journal can be had for $1.50 per year. Two cents a day will pay for them. As to time, thirty minutes a day would more than suffice to read every line in the two publications and at the same time do a little thinking, also to see that each number is put away in some systematic manner for future reference.

I recall two men who have been my assistants by the way they did analytical work with pencil and paper rather than with the bal-

ance and burette. Why all this detail anyhow? The U. S. P. contains many tests and assays for determining the purity of the official preparations, but these men seemed to think that since the majority of samples received for testing were all right, they could make a guess at the purity, figure the results backward and get out of doing the tedious work which for them required too much patience. Quite naturally their methods were soon detected and fortunately no harm came of it outside of the laboratory. But we cannot say as much for them. They were destroying their self-respect, ambition and their opportunities for success.

These are the kind of men you are most likely to hear saying in after years, "I never had a chance."

Confidence in your ability is essential but some men are so conceited about it that they become blinded to their errors. It might be all right to have the other man believe you thoroughly capable but you should not let that feeling prejudice the analysis of your own mind and knowledge. When the other man finds you out his confidence in you will be very much weakened.

This failing may be attributed to several reasons. It is usually due to narrow-mindedness, snobbishness, false pride, all of which are due to ignorance. It indicates the failure to have grasped the primary objects in attending college, namely, to obtain a knowledge of the basic principles of the subject and the failure to continue the line of study after leaving college. Give the text-books you are using here the most prominent place in your future undertakings and add to them from time to time when some good book useful, particularly for reference, is called to your attention. These books with the Journals mentioned before are the backbone of your success. Speaking of mistakes, I recall a former assistant who was very confident of his ability and would have you believe that his knowledge was complete, he could make any kind of an analysis, he could not be in error. He said he was not in error when he obtained a result much too low in assaying a sample of ipecac but the method was faulty. He tried it again several times, always obtaining a different result which was much too low. After his last failure I picked up a beaker which he had used for evaporating the etherial solution of the alkaloids and subsequent titration and called his attention to the resinous mass of alkaloids coating the side of the beaker which he had failed to dissolve in the volumetric acid solution. Another man required over one day to find out that a sample

labelled sodium thiosulphate was not what it was labelled, and then he spent several hours more in finding out that it was potassium nitrate.

I could tell you of many more such incidents. It is almost unbelievable that men who have been graduated by leading institutions of learning can be so helpless. The problems of the competition of life bring us to our senses and then we realize the opportunities that have been thrown away.

Coming back to my opening question, "What are you going to do one year from to-day?" If you take advantage of the opportunities before you during the year, you will be well equipped to consider with intelligence any problem that may be presented to you one year from to-day.

THE ASSAY OF ZINC STEARATE.

By Hans Gesell.

In the last few years the use of Zinc Stearate as an antiseptic and astringent has been constantly increasing; it is rather difficult, however, to obtain this salt free from impurities, namely alkalies, alkali earths, chlorides, and oleates. The tests in the Pharmacopœia do not give concordant results, so there is no question of the desirability of assay methods which will be accurate, yet simply and rapidly carried out by analysts. An excess of Zinc Oxide and Zinc Oleate seem to be the most frequent admixtures.

The usual analytic method by which the stearic acid is liberated by means of hydrochloric acid and floats on the surface of the hot liquid, also holds good for any Zinc Oleate present, and if not in excess, will even congeal with the stearic acid on cooling. This difficulty can easily be overcome as follows:

Take 1 gm. of Zinc Stearate and heat with 10 c.c. of distilled water and 1 c.c. of hydrochloric acid. The Stearic and oleic acid will be liberated and float as an oily layer. Let cool and this layer will solidify. Pour off acid liquid and wash the cake several times with water. Let dry. Determine the melting point. Pure Stearic acid melts at 69°, but as the Stearic acid of the market usually contains Palmitic acid, the melting point is usually 55–56°. Therefore, the melting point of this cake should not be below 55°—a lower melting point would surely point to the presence of oleic acid.

The residue after incineration which is chiefly Zinc Oxide should be about 13 per cent. It is certain Zinc Oxide does not harm in a preparation of this nature, yet it is advisable to determine if it is really Zinc Oxide. It is best done in the following manner:

Take 5 gm. of Zinc Stearate, add 10 c.c. of ½ N HCl and warm gently until all the Zinc Stearate is decomposed. Then with ½ N NaOH (Dimethyl Orange) titrate back the hydrochloric acid not used. Subtract this from the 10 c.c. taken, multiply it by the factor of Zinc Oxide, divide by the weight of Zinc Stearate taken, this will give the amount of Zinc Oxide in the compound. The Stearic acid could also be liberated and determined here, by simply separating the two liquids (warm), rejecting the aqueous portion, using phenolphthalein as indicator and titrating with ½ N NaOH.

In a series of 5 experiments the following results were obtained:

Melting point	Residue after incineration	Zinc found
49—50°	19.3 per cent.	15.1 per cent.
55—56°	13.6 per cent.	10.8 per cent.
55—56°	13.8 per cent.	10.9 per cent.
54—55°	14.6 per cent.	11.2 per cent.
55—56°	18.7 per cent.	14.8 per cent.

THE SALE OF BICHLORIDE TABLETS.[1]

A Discussion of the Need for Restriction of the Sale and Distribution of Bichloride of Mercury Tablets.

By Martin I. Wilbert,

Technical Assistant, Hygienic Laboratory, United States Public Health Service.

Some months since an alleged case of accidental poisoning by corrosive mercuric chloride, in Macon, Ga., was "featured" in practically all of the daily papers of the United States in such a way as to lead the unknowing to infer that poisoning by this substance guaranteed not alone a sure but also a painless death.

The notoriety given this case was followed by an apparently unusual number of corrosive sublimate fatalities, reported from the

[1] Reprint from the Public Health Reports, vol. xxviii, No. 46, Nov. 14, 1913.

various parts of the United States; and the publicity given to the harrowing details in connection with several of the cases was in turn followed by agitation for legislation on the part of some of the firm believers in the power of statute law to right all wrongs and to correct or, better, to prevent all possible abuses.

Bills designed to restrict fatalities from the accidental taking of tablets containing corrosive mercuric chloride have been introduced in several of the State legislatures. In Pennsylvania, an act prohibiting the sale of bichloride of mercury at retail except upon the prescription of a registered physician was adopted by both houses of the legislature, but vetoed by the governor for the reason that " the public is amply protected regarding this drug by the restrictions put upon the sale of other poisons. Besides, I am informed that it is a household commodity." As the agitation for special legislation to restrict or at least regulate the sale of tablets of corrosive mercuric chloride is destined to be revived by the supposedly accidental poisoning of a Brooklyn business man and to continue for some time to come, it may be of advantage to review briefly the several factors involved, the abuses really existing, the propositions that have been made to correct them, the safeguards already established, and the possible ways and means of bringing about desirable changes.

While it will generally be admitted to be impracticable to prevent suicide or violent death by law or regulation, it is nevertheless well recognized that despondent and melancholy humanity is ever ready to seize upon any suggestions that offer sure, speedy, and painless death, so that every report of death, accompanied by the details of the means and methods producing it can be counted on as an incentive for other deaths brought about in much the same way.

It is perhaps unfortunate that, for the rational study of the problem before us, no definite and satisfactory information is available as to the conditions actually existing in our own country. Our mortality statistics give only general death rates and standardized death rates, without furnishing any, even approximate, information regarding the nature of the poison used or taken in cases of reported fatalities. There is, however, available in the report of the registrar-general of births, deaths, and marriages for England and Wales, a detailed account of the nature and kind of substances used, both in suicides and in accidental deaths, and a careful study of the tables herewith presented will suffice to demonstrate the impracticability of legislating specifically for any one poison. The tables also at

least suggest the fact that there is probably little or no cause for undue excitement in regard to the possible number of deaths from the internal use of corrosive mercuric chloride and that, granting that conditions in England and this country are much the same, corrosive mercuric chloride plays but a minor part in the number of deaths due to ingested poison. This fact is further emphasized when we realize the very widespread use and, incidentally at least, abuse, of tablets of corrosive mercuric chloride and the comparatively few fatalities on record resulting from its internal administration. Even a careful search of the literature since the report of the case at Macon, Ga., shows that possibly 15, certainly not over 20, deaths have been reported from the ingestion of corrosive mercuric chloride since that time. When we remember that in the registration area

Suicides and accidental deaths from scheduled poisons reported by the registrar-general of births, deaths, and marriages for England and Wales for the year 1911.

Poison.	Suicides.			Accidental deaths.			Total deaths.
	Male.	Female.	Total.	Male.	Female.	Total.	
Aconite and belladonna liniment	...	1	1	..	1	1	2
Antimony (?)	...	...	...	1	..	1	1
Arsenic	4	1	5	1	2	3	8
Atropine	2	...	2	..	..	...	2
Belladonna	...	1	1	1	3	4	5
Belladonna liniment	1	...	1	...	...	...	1
Cantharides	...	...	...	..	1	1	1
Carbolic acid	32	57	89	6	4	10	99
Chloral hydrate	1	...	1	2	..	2	3
Chlorodyne	1	1	2	1	3	4	6
Chloroform	1	...	1	..	1	1	2
Cocaine and aconite	1	...	1	..	..	...	1
Cresolene	...	2	2	..	..	...	2
Hydrocyanic acid	22	2	24	3	..	3	27
Lysol	1	2	3	..	..	...	3
Mercuric chloride	3	2	5	2	..	2	7
Narcotic (kind not stated)	1	...	1	4	2	6	7
Nicotine	7	1	8	..	..	...	8
Opium (laudanum and morphine)	37	11	48	41	17	58	106
Oxalic acid	42	33	75	5	10	15	90
Paregoric	...	...	...	..	1	1	1
Potassium cyanide	33	3	36	5	..	5	41
Strychnine	7	6	13	1	3	4	17
Sulphonal	...	...	...	2	..	2	2
Vermin killer	1	1	2	..	..	...	2
Weed killer	1	...	1	..	1	1	2
White precipitate	...	1	1	..	..	...	1
Total	198	125	323	75	49	124	447

Suicides and accidental deaths from non-scheduled substances reported by the registrar-general of births, deaths, and marriages for England and Wales for the year 1911.

Poison.	Suicides.			Accidental deaths.			Total deaths.
	Male.	Female.	Total.	Male.	Female.	Total.	
Acetanilide	..	..	...	..	1	1	1
Acetic acid	1	1	2	..	..	...	2
Alcohol	..	..	...	2	..	2	2
Ammonia	1	7	8	7	7	14	22
Camphor	2	..	2	..	..	...	2
Camphorated oil	..	..	...	1	1	2	2
Caustic potash	..	1	1	..	..	...	1
Caustic soda	1	..	1	2	1	3	4
Chloride of lime	1	..	1	..	..	...	1
Chromic acid	1	..	1	..	..	...	1
Disinfectant (?)	..	1	1	2	..	2	3
Hartshorn and oil	..	..	...	1	..	1	1
Hydrochloric acid	43	30	73	19	7	26	99
Liniment (?)	..	2	2	1	..	1	3
Mercury (?)	1	..	1	1	..	1	2
Methylated spirit	..	..	...	..	2	2	2
Nitric acid	1	3	4	..	..	...	4
Paraffin	..	1	1	..	1	1	2
Pennyroyal	..	..	...	..	1	1	1
Phosphorus	1	7	8	1	1	2	10
Potassium bichromate	2	2	4	..	..	...	4
Potassium binoxalate	1	2	3	1	..	1	4
Potassium bromide	..	..	...	1	..	1	1
Potassium permanganate	..	1	1	1	1	2	3
Saltpeter	..	..	...	2	..	2	2
Sulphate of copper	..	1	1	..	..	...	1
Sulphuric acid	4	1	5	3	..	3	8
Veronal	..	2	2	8	9	17	19
Whisky	..	..	...	1	..	1	1
Zinc chloride	..	..	...	1	..	1	1
Kind not stated	39	21	60	13	15	28	88
Total	99	83	182	68	47	115	297

of the United States upward of 5000 deaths from acute poisoning are reported annually, even these apparently large figures are suggestive as being comparable with those included in the appended tables copied from the report of the registrar-general for England and Wales.

Corrosive mercuric chloride was introduced as an antiseptic in surgical procedure more than 30 years ago, and for two decades at least was widely known by the popular names "corrosive sublimate," "bichloride," or "sublimate," and used in the form of solutions for a variety of purposes. This widespread use led to its employment

in other directions, so that at the present time the statement made by the governor of Pennsylvania that bichloride of mercury "is a household commodity" is altogether too true, particularly of the tablets—pounds, if not tons, of which are sold annually for other than medicinal purposes.

A survey of the current price lists of five of the larger manufacturers of pharmaceutical preparations in the United States, presents some rather startling information, and suggests a really valid reason why tablets of corrosive mercuric chloride may be considered to be more important factors in the health and welfare of many members of the community than is generally supposed. Perhaps the most startling discovery is the fact that not a single manufacturer of tablets of corrosive mercuric chloride markets them under a name properly indicating the nature of the materials contained therein. In the lists referred to we find, under corrosive sublimate, mercuric chloride or mercury bichloride, a cross reference to antiseptic tablets or antiseptics, and under this heading the several price lists mentioned would present the following composite table:

A composite list of antiseptic tablets from the current price lists of five leading manufacturers.

Antiseptic disks.—Compressed. Green or white. Corrosive mercuric chloride 0.5 gm. with ammonium chloride.

Antiseptic tablets.—Compressed. White, blue, green, red, or pink. Corrosive mercuric chloride 0.5 gm. with ammonium chloride.

Antiseptic tablets.—White, blue, green, or red. Corrosive mercuric chloride 0.5 gm. with sodium chloride.

Antiseptic tablets, alkaline.—White, or pink. Sodium borate, sodium bicarbonate, sodium salicylate, sodium benzoate, sodium chloride, oil of eucalyptus, thymol, menthol, oil of gaultheria.

Antiseptic tablets, alkaline, effervescent.—White or pink (?). These tablets are superior to those usually sold, which harden with age and dissolve with difficulty.

Antiseptic tablets, alkaline, improved.—White or pink. Formula same as alkaline antiseptic tablets with addition of hydrastine hydrochloride and sanguinarine nitrate.

Antiseptic alkaline, improved.—Valuable as an injection in urethritis, vaginitis, and all diseases of the urethral and vaginal passages requiring a mild antiseptic and deodorant.

Antiseptic tablets, Bernays, small.—White, blue, or pink. Corrosive mercuric chloride 0.125 gm. with citric acid.

Antiseptic tablets, Bernays, large.—White, blue, or red. Corrosive mercuric chloride 0.5 gm. with citric acid.

Antiseptic tablets, Bernays, special large.—White or blue. Corrosive mercuric chloride 0.45 gm. with citric acid.

Antiseptic tablets, Clover.—White, blue, or pink. Corrosive mercuric chloride 0.45 gm. with citric acid.

Antiseptic tablets, cyanide.—White or pink. Mercuric cyanide 0.5 gm. with sodium borate.

Antiseptic tablets, detergent.—Sodium bicarbonate, sodium borate, sodium salicylate, eucalyptol, menthol, and oil of wintergreen.

Antiseptic tablets, detergent, improved.—Contain in addition to the ingredients mentioned above, sanguinarine nitrate and hydrastine hydrochloride.

Antiseptic tablets, diamond.—White, blue, or pink. Corrosive mercuric chloride 0.5 or 0.125 gm. with citric acid.

Antiseptic tablets, external.—White, green, pink, or blue. Corrosive mercuric chloride 0.5 gm. with ammonium chloride.

Antiseptic tablets, La Place.—Corrosive mercuric chloride 0.25 gm. with tartaric acid.

Antiseptic tablets, mercuric bichloride, Young's.—Blue. Nine varieties.

Antiseptic tablets, mercury cyanide.—White or pink. Mercuric cyanide 0.5 gm. with sodium borate.

Antiseptic tablets No. 3.—White or pink. Mercuric cyanide 0.5 gm. with borax.

Antiseptic tablets, St. J. Perry.—White or pink. Mercuric cyanide 0.5 gm. with ammonium chloride.

Antiseptic tablets No. 6.—Very soluble. White or blue. Corrosive mercuric chloride 0.5 gm. with citric acid.

Antiseptic tablets, potassium permanganate.—Compressed. Five varieties.

Antiseptic tablets, St. J. Perry.—White or pink. Mercuric cyanide 0.5 gm. with borax.

Antiseptic tablets, tartacid sublimate.—Corrosive mercuric chloride 0.25 gm. with tartaric acid.

Antiseptic tablets, Young's.—Blue. Corrosive mercuric chloride. Nine varieties.

Antiseptic tablets, Wilson's.—White, green, pink, or blue. Corrosive mercuric chloride 0.5 gm. with ammonium chloride.

The tablets in this list containing corrosive mercuric chloride are marketed in 16 varying sizes, 5 different shapes, and 5 different colors. Three of the shapes are distinctive and probably proprietary in nature. Obviously the most objectionable feature is the confusion which may arise from the totally misleading name applied to tablets containing highly toxic materials.

The possible abuse arising from the use of a totally misleading name for poisonous substances is further emphasized by the statement recently made by one of the agitators for legislation to provide a distinctive shape for "antiseptic tablets." This writer says: "It is a known fact that the tablets of corrosive sublimate are very easily

procured, and are used to a very large extent as a home remedy, hence they are not looked upon as the dangerous agents that they really are in the hands of the careless and ignorant."

Among the many suggestions that have been made to compel uniformity in shape and size of tablets of corrosive mercuric chloride, we have proposals to have them triangular, coffin-shaped, kidney-shaped, and in the shape of a skull, in addition to the various forms already in use. Suggestions have also been made to enact laws to compel manufacturers to color these tablets red, green, blue, yellow, and pink; also to give them a distinctive odor, and to compel their being dispensed in a uniform and distinctively shaped bottle; all of which, if it were practicable to enforce uniformity in all States and with all manufacturers, would at best tend to elaborate on the misuse of tablets of this kind, rather than to prevent accident, or their use as a poison for suicidal purposes.

Even at the present time there is sufficient legislation, if enforced, to serve as a reasonable safeguard in connection with the sale of corrosive mercuric chloride at retail. No less than 38 States include corrosive sublimate specifically in the laws designed to restrict the sale of poisons, and in but one of the existing laws, that of Utah, are corrosive sublimate tablets exempted from registration in the poison register, otherwise uniformly required for the sale of corrosive sublimate itself. During the present year, three States, Oregon, Nevada, and California, have enacted modified poison laws and specifically enumerate tablets of corrosive sublimate as belonging in "Schedule A," drugs, the sale of which is required to be registered in a book provided for that purpose. These several States also specifically enumerate "antiseptic tablets containing corrosive sublimate," being, so far, the only States recognizing the present-day custom of labelling these very toxic preparations, "antiseptic tablets."

In addition to specific agitation for the proper labelling of all preparations containing poisonous substances, the most promising innovation is the suggestion that a type form of corrosive mercuric chloride tablet or pastille be introduced in the Pharmacopœia of the United States, with a view of providing adequate safeguards to prevent accidental poisonings. While the suggestions that have been made for this purpose are many and varied, it would appear that, in view of the rapidly growing intercourse between the different countries of the world, it might be desirable to secure international uniformity in regard to preparations of this type. It has been pro-

posed, unless specific and valid objections could be offered, to adopt for inclusion in the Pharmacopœia of the United States the description of mercuric chloride pastilles included in the German Pharmacopœia. This latter Pharmacopœia provides that pastilles of mercuric chloride consist of equal parts of corrosive mercuric chloride and sodium chloride, and requires that the pastilles be colored bright red with aniline dye, have a cylindrical shape, and be twice as long as thick. These tablets or pastilles must be wrapped individually in black paper, bearing the German equivalent of the word poison in white letters. The weight of a tablet must be stated, and the wrapped tablet is to be dispensed only in suitable glass bottles or tubes.

As an argument for including in the Pharmacopœia of the United States an official tablet of corrosive mercuric chloride, rather than enacting legislation to compel uniformity in the shape, size, color, and odor of all tablets containing corrosive mercuric chloride, it has been pointed out that inclusion in the Pharmacopœia would not in any way interfere with the legitimately established trade of manufacturers, but would tend to discourage the sale and use of such preparations and bring about the gradual popularization of the official tablet. If, in addition to this, it were practicable to induce manufacturers properly to label all of their preparations so as to indicate the presence of any highly toxic substance, and then to suggest to purchasers of tablets of this kind the need for keeping them apart or in such a way that they could not readily be mistaken for other nontoxic preparations, little or no additional legislation would be necessary, unless it were to restrict newspapers from publishing unnecessary details in regard to the nature and kind of poison used in cases of accidental or intentional poisoning.

PROGRESS IN PHARMACY.

A Quarterly Review of Some of the More Interesting Literature Relating to Pharmacy and Materia Medica.

By M. I. Wilbert, Washington, D. C.

An unusual amount of activity is being reflected in current pharmaceutical and drug journals. While much of this activity is more or less closely related to renewed interest in the revision of the Pharmacopœia, awakened by the publication of the first instal-

ment of Abstracts of Proposed Changes, with New Standards and Descriptions to be included in the U. S. P. IX, legislation and the prospective meetings of national and state associations are also being actively discussed in all sections of the country.

LOOKING AHEAD.—The editor of the *Bulletin of Pharmacy* suggests some reform measures for the A. Ph. A., which deserve the careful attention and the hearty co-operation of every member of that association. The proposed reforms of immediate interest concern the coming meeting of the A. Ph. A., more particularly the program of section meetings. Not the least important of the suggestions made is the proposition to have the Council meeting held in the evenings so as to eliminate the constantly increasing interference of the Council meetings with the meetings of the sections. Another proposition of considerable interest is the suggestion to restrict the scientific meetings of the Association sections to two sessions a day. The third proposition is to eliminate from the now existing sections such as do not warrant continuance and thus restrict the scientific business of the Association to simultaneous sessions of a limited number of sections for a sufficient number of days to transact all of the business in hand. If in addition to these several reforms the unnecessary interference by entertainment features could be eliminated, there is no reason why the meetings of the American Pharmaceutical Association should not be held as are the meetings of the American Medical Association, in from 3 to 4 days, allowing the additional days of the week for entertainments or for the meetings of correlated societies and associations that choose to convene at or about the same time that the American Pharmaceutical Association does. Mr. Mason truthfully says that the existing trouble with the A. Ph. A. "arises from too much energy instead of too little, and what is needed is that this energy in its manifold manifestations be harnessed up and co-ordinated in a more intelligent manner. . . . The situation at Nashville last August was one of confusion worse confounded. There were the seven regular sections of the Association, each holding two or three sessions. There was the annual meeting of the National Association of Boards of Pharmacy with four or five sessions. There was the annual meeting of the Conference of Pharmaceutical Faculties, and the joint conference of the section on Education and Legislation of the A. Ph. A. . . With it all there was no let-up in the work from nine o'clock in the morning until one or two o'clock the next morning. Everybody was

tired out. Everybody was more or less befuddled by the multiplicity of business. . . . The A. Ph. A. has outgrown the clothes of a growing youth and now needs the equipment of the adult it has come to be. Particularly are the annual meetings in need of reform if they are successfully, intelligently and efficiently to handle the vast amount of work undertaken by the Association."—*Bull. Pharm.*, 1914, v. 28, pp. 67–70.

Drug Trades' Conference.—A meeting of the National Drug Trades' Conference was held at Washington, January 12 to 14, all of the several national organizations being represented. Among the resolutions adopted by the Conference were:

One asking newspapers to omit as far as possible all detail of poisons or other instruments employed in suicide and murder.

One recommending that legislation relating to methods of packing and labelling of corrosive mercuric chloride tablets and other dangerous toxic drugs be deferred, pending a report by the Committees of Revision of the Pharmacopœia and the National Formulary, and tendering such aid as the members of the conference may be in a position to give in making the revision, in order that suitable regulation with respect to these drugs may be made.

One requesting the Postmaster-General to change paragraph 5 of section 472 of the postal regulations, so as to permit the mailing as first-class matter of poisonous substances packed in metal containers, bearing the name of the sender and the word " Poison."

One requesting that the Committee of Revision of the United States Pharmacopœia consider the desirability of inserting in the forthcoming revision of the United States Pharmacopœia a section defining the word " poison."—*Drug. Circ.*, 1914, v. 58, p. 99.

Poison Bottles.—*Anon.* The use of a special bottle for poisons is not enforced by law in the United States, although legislation embodying the principle has more than once been attempted in various States. On what grounds the proposals have been rejected we cannot understand, for there is ample proof in the experience of our own country that the " poison bottle " is an excellent danger signal.—*Pharm. J.*, 1914, v. 92, p. 89.

Restriction of Sale of Coal-tar Synthetics.—The Kansas City Association of Retail Druggists is conducting an energetic movement toward legislation prohibiting the sale of antipyrin, acetphenetidin, and acetanilide, except on physicians' prescriptions.—*Drug. Circ.*, 1914, v. 58, p. 103.

DRUG STORE STRIKE.—The advantages of efficient organization and co-operation are well emphasized in a recent number of the *Pharmazeutische Post* (December 24, 1913, v. 46, pp. 1109–1112), which publishes an illustrated description of a successful drug store strike in Argentine brought about by a proposal to increase the stamp tax on specialties and perfumery, and to impose a complicated method of control which the druggists of Argentine considered impracticable. The strike was general, every drug store in Argentine closing on a given date and the concerted action promptly resulted in the law being set aside for the time being and subsequently revised.

USEFUL DRUGS.—An editorial designates the recently published volume on Useful Drugs as a book with a purpose that will mark an era in American medicine and will likewise have a distinct effect upon American pharmacy. The editor criticizes the inclusion of syrup of sarsaparilla on the mistaken supposition that its use is recommended as a vehicle but concludes that even this is a minor matter and Useful Drugs has a purpose and also has a future.—*Drug. Circ.*, 1914, v. 58, p. 66.

In a book review, p. 98, the same journal adds: "Useful Drugs can therefore be described as the ideal epitome, and the pharmacist interested in his prescription department will do well to aid in the circulation of the work by distributing it among physicians of his own neighborhood."

DIGEST OF COMMENTS ON THE PHARMACOPŒIA OF THE UNITED STATES OF AMERICA.—A book review of *Hyg. Lab. Bull.*, No. 87, says in part: "In the period covered by this, the seventh in the series of 'Digests,' the critical character of the comments on the German Pharmacopœia might be taken to indicate that the makers of pharmacopœias must in the future cater to a more and more discriminating constituency. This attitude on the part of users of pharmacopœias is still further emphasized by the growing demand for a limited materia medica and, by inference, the limitation of the scope of the pharmacopœia to substances of recognized therapeutic efficacy and substances which, to some degree at least, lend themselves to adequate standardization, whether chemical or physiologic.—*J. Am. M. Assoc.*, v. 61, p. 2005.

JAPANESE PHARMACOPŒIA.—A new revision of the monographs of the Ph. Japon III is announced as taking effect December 27, 1913. The changes involve acetylsalicylic acid, lanolin and oil of sandalwood.—*Chem. and Drug.*, 1914, v. 84, p. 167.

PH. BRIT.—The British Pharmacopœia Committee reports that "Two further sections of the text of the new Pharmacopœia have been prepared by the editors, and have been submitted to the Committee and to the several Committees of Reference. All the sections so prepared have been sent to press and are at present in type, undergoing revision. It is hoped that the appendix, and the concluding parts of the draft, will be ready for consideration early in the new year."—*Pharm. J.*, 1913, v. 91, p. 849.

PHARMACOPŒAL DOSES.—An editorial, in commenting on a proposition, recently made in the Medical Press of Great Britain, to adjust the strength of tinctures so that the doses of various groups distinguished by prefixing "per" and "sub" would be the same, says: "Pharmaceutically the strength of tinctures is only of importance when regarded from the point of view of providing sufficient menstruum adequately to exhaust a drug." "In regard to the suggestion as to names the question arises in connection with subtinctures, will the alcohol or the drug in the tincture be the more grateful and comforting to the patient?"—*Chem. and Drug.*; 1914, v. 84, pp. 19–20.

PROPRIETARY MEDICINES IN GREAT BRITAIN.—Xrayser II, commenting on the first year of medical benefit under the insurance act in Great Britain, asserts that it has brought with it a marked change in the nature of business done by chemists and druggists. One man reports that he will dispense 10,000 prescriptions and upon the whole he is satisfied from the profit realized directly from this source. The increase in the prescription business is further notable for the fact that the trade in proprietaries has considerably decreased and should mean that chemists as a whole are enjoying, and will continue to enjoy, the increase in what is after dispensing the most profitable department of their business.—*Chem. and Drug.*, 1914, v. 84, p. 85.

HISTORICAL MEDICAL MUSEUM.—An unsigned article presents a number of illustrations of the Historical Medical Exhibition in Wigmore Street, London, which was organized by Henry S. Wellcome and opened on the occasion of the International Medical Congress during last summer. This museum is now being rearranged as a permanent institution and there is probably nothing in existence elsewhere which is quite like the collection which will shortly be available for the use of students and others interested in the study of antiquarian medicine and surgery. The illustrations include a reproduction of the exterior of a London apothecary's shop of the 17th Century,

"At the sign of 'Ye wild man,'" a reproduction of Liebig's laboratory at Giessen, and the interior of an Italian pharmacy of the 16th Century.—*Pharm. J.*, 1913, v. 91, pp. 944–945.

HISTORY OF PHARMACY.—The *Chemist and Druggist*, January 31, 1914, v. 84, p. 183, announces that an arrangement has been made with the publishers of the "Chronicles of Pharmacy," by the late A. C. Wooton, which enables that journal to offer this book in two volumes at 7s. 6d., carriage paid in the United Kingdom, or 8s. post free to any part abroad. This exceptional offer should popularize the book and make it available to all pharmacists who are in any way interested in the history of their craft. Orders for the volumes should be addressed to the book department of the *Chemist and Druggist*, 42 Cannon Street, London, E. C.

FRIEDMANN INSTITUTES are being organized in various parts of the country and the personnel of these organizations in practically every instance is sufficient to suggest their true nature. Steps have been taken in several states to check this exploitation of the consumptive for commercial gain. But what is most needed is that these unscrupulous attempts should be met with an intensive campaign of education of the public concerning the dangers and worthlessness of this treatment.—*J. Am. M. Assoc.*, 1913, v. 61, p. 1050.

U. S. PATENT FOR A COMPLEX MEDICINE.—An editorial calls attention to U. S. Patent 1,081,069, granted December 9, 1913, for a mixture of excretory constituents—creatinin, guanidin, and allantoin—to be used as a specific in a number of microbial infections and illnesses. The editorial states that the granting of a patent on the claims made should be sufficient to show the need of change in the method of granting patents, at least in the methods governing the issuance of patents for medicinal products.—*J. Am. M. Assoc.*, 1914, v. 62, pp. 54–55.

ALOES.—Tutin and Naunton report an investigation to ascertain if any anthraquinone derivative other than aloe-emodin is contained in aloes. They were unable to isolate such compounds as emodin and chrysophanol but found several samples of aloes which contained aloe-emodin as an impurity.—*Pharm. J.*, 1913, v. 91, p. 836.

ALYPIN, MISLEADING ADVERTISEMENT OF.—Bruck, F., called attention four years ago to the misleading statements in the advertising of alypin. Both an anæsthetic and blood-expelling action are claimed for it but in reality it has none of the latter. It is also stated that alypin is considerably less toxic than cocaine, while Schröder and

others have found that it is fully as toxic as cocaine and the last supplement to the German Pharmacopœia gives the maximum dose the same for both alypin and cocaine.—*Therap. Monatsh.,* Berlin, 1913, v. 27, p. 787.

ARHEOL is a proprietory name for santalol, $C_{15}H_{26}OH$, a sequiterpenic alcohol, the chief constituent of sandalwood. Arheol is a colorless, oily liquid; specific gravity, 0.979 at 15° C. It is insoluble in water but soluble in alcohol. It boils under 11 mm. pressure at 169°, and under ordinary pressure at about 500° C.—*J. Am. M. Assoc.,* 1913, v. 61, p. 1900.

ATOPHAN, SECONDARY EFFECTS OF.—Phillips, John, calls attention to the occurrence of various skin rashes caused by the administration of atophan and reports 5 cases. These rashes resemble those following the administration of antipyrine and indicate that atophan should not be given in the treatment of urticaria as has been advised. —*J. Am. M. Assoc.,* 1913, v. 61, p. 1040.

BEHRING'S DIPHTHERIA VACCINE.—Kissling, K., reports on the application of Behring's new vaccine to immunize children who had been exposed to diphtheria in different wards of the Hamburg general hospital. Of the 310 children treated, 111 were given a second injection and none of this group has contracted diphtheria, and only 8 among the remaining 199. In these cases the patients were convalescing from scarlet fever and the diphtheria was exceptionally mild, or the vaccine did not have time to act before the diphtheria developed; several days are required for the vaccine to complete the immunization. Adults respond with more of a reaction to the vaccine than children. Pre-existing disease of any kind does not seem to be a contra-indication. (*Deutsch. med. Wchnschr.,* 1913, v. 39, No. 51.)—*J. Am. M. Assoc.,* 1914, v. 62, p. 418.

CEREUS GRANDIFLORUS.—Gröber, A. Many contradictory statements have been published as to the activity of *Cactus grandiflorus* and its value as a heart remedy. The pharmacological experiments of the author show that the drug exerts some action on the frog's heart similar to digitalis. This may be attributed to the glucoside present as well as to the alkaloid. The amount of active principles present in the drug is, however, so small, that it cannot be considered in any way as a substitute for digitalis in human therapeutics.—*Therap. Monatsh.,* 1913, v. 27, pp. 580–581.

CHROMIUM SULPHATE.—Kolipinski, S., is quoted as saying: "The diseases in which chromium has been used with success are:

cirrhosis of the female breast, castration, menopause, functional impotency in men, chronic alcoholism, nervous vomiting and vomiting in pregnancy, neurasthenia, locomotor ataxia, exophthalmic goiter and the migraines."—*J. Am. M. Assoc.*, 1913, v. 61, p. 1921.

CUNILA MARIANA L., A SUBSTITUTE FOR SPIGELIA.—Stockberger, W. W. Several samples offered as pink root, recently submitted by dealers in crude drugs, were found on investigation to be spurious and to consist largely of *Cunila mariana L.*—*J. Am. Pharm. Assoc.*, 1914, v. 3, pp. 33–34.

CUSYLOL.—Cusylol is a soluble form of copper citrate, introduced for use in ophthalmic work. It is a blue crystalline powder, soluble about 1 : 3 in water. The powder is stable. Solutions above 1 : 1,000 in strength do not keep well, since they attack some kinds of glass with the formation of a flocculent deposit.—*Pharm. J.*, 1914, v. 92, p. 136.

DIGIPAN, according to the manufacturers, represents, with the exception of digitonin, all of the glucosides of digitalis leaves, obtainable by extraction at not exceeding 30°.—*Südd. Apoth.-Ztg.*, 1913, v. 53, p. 833.

DIOGENAL is a new sedative related to veronal. Chemically it is dibrom-propyl-diethyl-barbituric acid, $C_{11}H_{16}Br_2N_2O_2$. It is a white crystalline powder melting at 126°. The average dose is 15 grains.—*Chem. and Drug.*, 1914, v. 84, p. 37.

ECHINACEA.—*Anon.* Echinacea has been claimed to be a "specific" for rattlesnake bite, syphilis, typhoid fever, malaria, diphtheria and hydrophobia. Later enthusiasts have credited it with equally certain curative effects in tuberculosis, tetanus and exophthalmic goiter, and with power of retarding the development of cancer. On the basis of the available evidence the Council on Pharmacy and Chemistry decided that echinacea was not worthy of recognition as a drug of probable value. Accordingly it voted not to describe the drug in New and Non-official Remedies (*The Journal*, Nov. 27, 1909, p. 1836). So far as can be learned no reliable evidence for the claims made for this drug has been presented since the Council decided that the available evidence did not entitle it to a place in New and Non-official Remedies.—*J. Am. M. Assoc.*, v. 61, p. 2089.

ELARSON is the strontium salt of chlorarsenobehenolic acid, containing about 13 per cent. of elementary arsenic and about 6 per cent. of chloride. It occurs as an almost white, amorphous, tasteless powder, insoluble in water but slightly soluble in alcohol and ether.

The average adult dose of elarson is 0.008 gm. (⅛ grain), three to five times daily, best taken about an hour after meals.—*J. Am. M. Assoc.*, 1914, v. 62, p. 379.

EMETINE HYDROCHLORIDE.—Korns, John H. Emetine hydrochloride is the approved method of treatment for amœbic dysentery among missionary physicians in China. In a recent report of 17 cases, 16 did well under the emetine treatment, the 1 exceptional case had been treated unsuccessfully with ipecac powders six months previously.—*J. Am. M. Assoc.*, 1914, v. 62, p. 475.

ERGOT, according to Lieb, owes its pharmacologic action to several constituents; of these, ergotoxine alone is specific. Beta-imidoazolyethylamin, parahydroxyphenylethylamin, and the other sympathoninetic amines are products of the putrefaction which occurs during the manufacture of galenical preparations. Each constituent has a distinct pharmacologic action; stimulation of the uterus is characteristic of them all.—*J. Am. M. Assoc.*, 1914, v. 62, p. 486.

FUCITOL.—Votocek and Potmesil. Fucose, the sugar obtained from bladder-wrack, *Fucus vesiculosus,* when reduced with sodium amalgam, is converted into the alcohol fucitol. This new alcohol crystallizes from ethyl alcohol in silvery leaflets which melt at 153–154° C. Rhodeose and fucóse are stereo-isomers, and the corresponding alcohols, fucitol and rhoditol, are respectively laevo- and dextro-rotary to the same degree. By mixing the two alcohols in equimolecular proportions in hot alcohol, racemic fucitol is obtained. (*Berichte,* 1913, v. 46, p. 3653.)—*Pharm. J.*, 1913, v. 91, p. 911.

GITONIN.—Windhaus and Schneckenburger have recently separated a new digitalis glucoside from Kiliani's digitonin. Digitonin was dissolved in hot alcohol, 95 per cent. On setting aside the solution for some weeks an amorphous deposit was formed containing the new glucoside. Gitonin is but sparingly soluble in water, in methyl, and in ethyl alcohols. It is insoluble in acetone and in ether. It becomes yellow when heated to 255° C. and decomposes at about 272° C. With sulphuric acid it gives at first a pink, then a red color. The exact formula of the glucoside has not yet been determined; provisionally it is given as $C_{29}H_{80}O_{23}$.—*Pharm. J.*, 1913, v. 91, p. 911.

HEDIORITE is the lactone of a-glucoheptonic acid. It is recommended, to the extent of 30 gms. per diem, for diabetic patients. It forms crystals melting at 145° to 148°, easily soluble in water.—*Chem. and Drug.*, 1914, v. 84, p. 89.

HYDROXYPHENYLETHYLAMIN.—The pharmacologic investigation

of synthetic aromatic amines has been greatly stimulated by the discovery of the chemical structure of epinephrine and the demonstration that it belongs in this group of organic compounds. The systematic testing of numerous related and suitably constituted amines has shown that in general they exhibit pressor effects on the circulation and other physiologic phenomena characteristic of the effective agent of the adrenals, their activity increasing according as they approach the chemical structure of epinephrine. One of the most interesting of all these newly investigated products is hydroxyphenylethylamin, which can readily be prepared from the protein cleavage derivative tyrosin by splitting off carbon dioxide from the molecule of the latter. This reaction can be brought about by putrefactive bacteria; and in truth hydroxyphenylethylamin has been detected among the products of putrefaction of proteins and identified by Barger among the pressor principles yielded by putrid meat.—*J. Am. M. Assoc.*, 1914, v. 62, p. 46.

LACTIC ACID FERMENTS.—Puckner, W. A. The frequently made assertions that the lactic acid preparations on the market are worthless, led to an examination of the available commercial products. This examination showed that while all products containing living bacteria are bound to deteriorate, the preparations examined were in viable condition, though, as was to be expected, liquid cultures were more active than were the tablet preparations. It was also found that manufacturers of these products are making every effort to insure the dispensing of reliable preparations when they are ordered by physicians.—*J. Am. M. Assoc.*, 1913, v. 61, p. 2084.

LIQUID PARAFFIN.—Peck, J. Wicliffe, calls attention to the widespread use of liquid paraffin for chronic constipation, in different sections of Great Britain, and to the possibility of developing the sale of this article as a specialty. He also points out that there is a great difference in the viscosity of the many samples obtained and that it is preferable to use one having a medium specific gravity. The more fluid ones are not so useful in the treatment of intestinal stasis and the heavier preparations are apt to be objectionable because they do not easily leave the mouth.—*Pharm. J.*, 1914, v. 92, pp. 28–29.

LIQUID PARAFFIN.—Chrysopathes, J. G. During the Balkan war 920 cases of wounds were dressed with liquid paraffin. In nearly every case the wound healed over in a remarkably short time; even gaping wounds with exposed bones began to heal at once. The oil, in fact, is recommended as a dressing for sores of all kinds, and

where there is severe suppuration the addition of 2 per cent. of iodoform improves matters. (*Zentralbl. für Chirurg.*, Leipsic, November 8, 1913.)—*Pharm. J.*, 1914, v. 92, p. 6.

OPIUM.—Mr. Jewel, the American Consul at Vladivostok, reports that poppy culture was introduced into the Ussuri district by Chinese, and in 1907 the exports to China amounted to 7223 lbs. This has since increased.—*Pharm. J.*, 1914, v. 92, p. 79.

ORGANIC SILVER SALTS.—Rogers, L. With the exception of argyrol, all of the organic silver compounds tested had a decided bactericidal action against the dysentery bacillus when dissolved in water, being effective in five minutes in dilutions of 1 in 2500 and upwards. In the presence of a little broth, however, their action was always weaker, but in a variable degree.—*J. Am. M. Assoc.*, 1914, v. 62, p. 412.

PERHYDRIT is a combination of hydrogen peroxide with urea, marketed in the form of 1 gm. tablets representing from 0.34 to 0.35 per cent. of hydrogen peroxide and therefore a solid form of hydrogen peroxide which when dissolved in water may be used as a disinfectant.—*Südd. Apoth.-Ztg.*, 1913, v. 53, p. 841.

PHENOLSULPHONEPHTHALEIN is a product of the interaction of phenol and sulphobenzoic acid anhydride, differing from phenolphthalein in that a CO group of the latter is replaced by a SO_2 group. Phenolsulphonephthalein is used for determining the functional activity of the kidney. When injected intramuscularly or intravenously it begins to be excreted in normal cases in from five to ten minutes. In cases of a deficient functional activity, the first appearance of its secretion is delayed.—*J. Am. M. Assoc.*, 1914, v. 62, pp. 297–298.

PHENOVAL is a-brom-isovaleryl-paraphenetidin, $(CH_3)_2CH.CHBr.CO.NH.C_6H_4.OC_2H_5$. It is a new crystalline compound melting at 149° to 150°, and is recommended as sedative and hypnotic. It is insoluble in water, but is soluble in the usual organic solvents. Its dose is from 0.5 to 1.0 gm.—*Chem. and Drug.*, 1914, v. 84, p. 89.

PIKRASTOL, administered in cases of epilepsy, is dimethyloldiformyl-methyleneyl-tetramethylene-pentamine, $C_9H_{17}N_5O_4$. It is amorphous, and does not appear to have a well-defined melting point.—*Chem. and Drug.*, 1914, v. 84, p. 37.

QUININE.—MacGilchrist, A. C., claims that precipitated quinine base is the best all-round form in which to administer quinine by mouth; it can be administered intravenously, and it is preferable to any quinine salt in cases in which hæmoglobinuria is dreaded. (*Ind.*

J. Medical Research, 1913, v. 1, No. 2.)—*J. Am. M. Assoc.,* 1914, v. 62, p. 413.

QUININE AND UREA HYDROCHLORIDE.—Cables, H. A., reports eight cases of sciatica treated by hypodermic injections of a four per cent. solution of quinine and urea hydrochloride in normal salt solution. There were 50 injections in all, but no untoward results other than a little soreness that always follows hypodermic injections. Seven patients received six injections each and one received eight.—*J. Am. M. Assoc.,* 1913, v. 61, p. 2303.

RABIES AND THE PASTEUR TREATMENT.—*Anon.* The work of Pasteur drew the attention of the medical profession and the laity to rabies, which up to that time had apparently been neglected. The fatality among Pasteur-treated patients is less than 1 per cent., while the death-rate for all persons bitten by rabid animals is considered to be from 15 to 20 per cent.—*J. Am. M. Assoc.,* 1913, v. 61, p. 1923.

RADIUM.—A recent census of the quantity of radium salts at present in the various laboratories of the world shows that this does not exceed the equivalent of 7 gms. of metallic radium. From 1899 to 1904, from 13 tons of pitch-blende residuum, it was possible to extract only 2 or 3 gms. of radium. Then a stop was put by law to the export of radiferous material from Austria. Radium has since been extracted in France from much poorer ores containing only from ½ to 2 mgms. per ton, whereas the Austrian pitch-blende contained quite 100 times as much. Besides its use in medicine, its application in the industries is spreading. Radium has been used in silk factories for de-electrifying the material and the machines. It is possible to realize, with radium, an apparatus for measuring from a distance the potential of a conductor, without contact.—*Pharm. J.,* 1913, v. 91, p. 938.

RADIUM IN AUSTRALIA.—*Anon.* Important radio-active minerals are stated to have been discovered at two places in South Australia. In one of these cases the material as a whole did not contain sufficient uranium and vanadium to be of commercial importance in the crude state, but results of considerable scientific interest are said to have been obtained in the course of the inquiry. The composition of another radio-active ore in South Australia has also been determined.—*Pharm. J.,* 1914, v. 92, p. 115.

SAFFRON.—Holmes, E. M., in a review of the varieties of saffron, points out that although this plant is cultivated in most of the large countries for home use, it is exported from very few and its adulteration from the time of Pliny to the present day expresses

to some extent its scarcity. For more than 1000 and probably 2000 years saffron has held its own as a medicine and as an ingredient in food, and it is hardly to be supposed that this would be the case if it possessed no useful properties.—*Pharm. J.*, 1913, v. 91, pp. 941–943.

SALVARSAN.—Editorial. In salvarsan and neosalvarsan reliance is placed in combinations of arsenic of complex molecular structure. In this form the arsenic is relatively non-toxic, but as in the case of many other compounds, the biochemical agencies of the body may split the complex chemical structures into simpler ones, reducing the non-toxic combinations into products which may be highly toxic to the tissues of the human organism. So long as we are not able to predict with certainty what chemical reactions may take place within the body under various conditions, there will remain more or less risk connected with the administration of drugs so potentially toxic as are these higher compounds of arsenic. For future guidance, all instances of unfavorable outcome after their use should be recorded in detail with great care.—*J. Am. M. Assoc.*, 1913, v. 61, p. 2074.

PERMANENT SCOPOLAMINE SOLUTION.—The presence of the higher alcohols, such as mannitol or dulcitol, in solutions of scopolamine, renders them more permanent, and the use of these for this purpose is the subject of a German patent.—*Pharm. J.*, 1913, v. 91, p. 943.

SIAM BENZOIN.—Holmes, E. M., gives an interesting summary of the efforts that have been made in the last 50 or 60 years to find the botanical source of Siam Benzoin. The evidence adduced seems to indicate that the chief, if not the only source of the Siam Benzoin of commerce, is *Styrax Tonkinense*, Craib, which is found in the district between Luang Prabang and Hanoi; second, that the *Styrax benzoides* of Northwest Siam yield a fragrant resin, used locally, but the evidence that it yields any of the Siam benzoin of commerce is not equally satisfactory.—*Pharm. J.*, 1913, v. 91, pp. 804–806.

SPIRIT OF NITROUS ETHER.—Hodgson and Bailey report tests to determine how far the defense usually set up in prosecutions is justified. Results show that spirit of nitrous ether retains its strength remarkably well if kept in small, tightly stoppered bottles and not opened too frequently.—*Pharm. J.*, 1914, v. 92, p. 28.

SYRUPS, FERMENTATION OF.—Cochran and Perkins report an investigation on the influence of small amounts of ethyl alcohol on fermentation in cane sugar syrup, and conclude:

1. One per cent. or less of alcohol markedly accelerates fermentation in syrup of average densities.

2. 1.25 per cent. alcohol has very little influence.

3. Beginning with 1.25 per cent. the presence of alcohol retards fermentation in these syrups, the amount of retardation increasing with the increase in the percentage of alcohol.—*J. Ind. and Eng. Chem.*, 1914, v. 6, p. 141.

THEOFORM.—A condensation product of theobromine with a formaldehyde-liberating substance has been put on the market under the name of theoform. It is claimed to contain 85 per cent. of theobromine, and is therefore richer in that base than diuretin or agurin. A white, bitter powder, soluble 1 : 50 in water at ordinary temperatures, but is not stable in neutral or alkaline solution.—*Pharm. J.*, 1914, v. 92, p. 62.

THYMOLPHTHALEIN occurs in colorless needles, melting at 245–246° C.; readily soluble in alcohol and in acetone; sparingly dissolved by chloroform or by ether. It dissolves in caustic alkalies with the formation of a blue color; it may therefore serve as an indicator for alkalimetry, for the color is not affected by excess of alkali.—*Pharm. J.*, 1913, v. 91, p. 881.

THYROIDEUM SICCUM.—Bennett, Reginald R., discusses the relative weight of dried and of fresh thyroid gland, and questions the frequently made statement that 1 part by weight of the dried thyroid represents 5 parts by weight of the fresh thyroid. Some observations of his own lead him to believe that the relation is more nearly 1 to 4.—*Pharm. J.*, 1913, v. 91, p. 804.

TYRENE.—Para-iodo-ortho-sulpho-cyclo-hexa-triene pyridine is conveniently shortened for ordinary purposes to tryene. An odorless, non-toxic powder, soluble in hot water, it is introduced as an antiseptic. Specially recommended for use in gynæcology and as a dressing for wounds, either as a dusting powder, gauze or ōn tampons.—*Pharm. J.*, 1914, v. 92, p. 62.

ULSANIN.—Described as "hydroiodoborate," is put forward as a new non-poisonous but active disinfectant and healing application for the treatment of wounds. It is a somewhat hygroscopic powder, which, in contact with wound secretions, liberates iodine and oxygen. —*Pharm. J.*, 1913, v. 92, p. 102.

VACCINE.—*Anon.* The virus of variola and of vaccinia is less sensitive to the action of glycerin than bacteria in general, and for this reason it is possible to obtain an almost pure virus of practically

full strength. Prolonged action of the glycerin, however, destroys the virus, but more rapidly at 37° C. than in the cold; if kept at from —5° to —15° C. glycerinated virus may remain active for five years. —*J. Am. M. Assoc.*, 1913, v. 61, p. 2074.

"ZYMASE" IN FERMENTATION TESTS.—Rosenbloom, Jacob. The zymase of yeast can readily be separated by grinding compressed yeast in a mortar with water and sand and adding the expressed liquid to 5 times its volume of alcohol. The precipitate is allowed to settle, filtered and washed with alcohol followed by ether. The precipitate is then dried and preserved in tightly corked amber bottles. Enzyme in this form is still active five months after its preparation.—*J. Am. M. Assoc.*, 1914, v. 62, p. 377.

BOOK REVIEW.

E. MERCK'S ANNUAL REPORT OF RECENT ADVANCES IN PHARMACEUTICAL CHEMISTRY AND THERAPEUTICS. 1912. Volume xxvi.

It is not only a pleasure, but pleasure combined with profit to read this annual report devoted to pharmaceutical chemistry and therapeutics; profitable because it keeps one in touch with current literature, and particularly literature from foreign sources, that embraces these two branches of pharmacy and medicine. This is clearly evidenced in the first article which in quite an exhaustive manner deals with Lecithin, 50 pages being required to deal with this organic compound which is so widely distributed in the human and animal organisms, and 21 pages containing references to the literature consulted, making a total of 71 pages.

Preparations and drugs mainly chemicals, and more particularly the action of synthetic chemicals, are commented upon as to their advantages and disadvantages when introduced into the human economy. When attention is called to the fact that this information requires 401 pages one can readily perceive what a wide field is covered.

Organotherapeutics is covered very thoroughly and many interesting things are brought to light in connection with this form of medication.

A supplement to the report contains a very informative paper by Professor Dr. R. Heinz, Director of the Pharmacological Institute of the University of Erlangen on "The Assay and Standardisation of Digitalis Preparations."

JOHN K. THUM.

CURRENT LITERATURE.

THE BAD TASTE IN HYPOCHLORITE-TREATED WATER-SUPPLIES.—It is surprising, as pointed out by Lederer (*Proc. Ill. Water Supply Assn.*, 1913, p. 235), that so little attention has been paid to the question of removing the taste from water-supplies treated with chlorinated lime. In this country, especially, where the treatment of many large public supplies has been carried out with brilliant sanitary success, there has been frequent and often bitter complaint about the taste of the treated water. As well known, antagonism has developed in many places between water boards and health departments as a result of these conditions. On one side is the recognition that the danger from water-borne diseases is greatly reduced by hypochlorite treatment: on the other is the necessity of having to bear the burden of daily complaint and to meet the indignant protests of thousands of aggrieved water-drinkers. As pointed out by Lederer, a simple method is available for removing the taste from hypochlorite-treated water. After careful experimenting he has confirmed the advantage of sodium thiosulphite ($Na_2S_2O_3$, $5H_2O$) as recommended by Bruns. The reaction on the residual chlorin is as follows: $Na_2S_2O_3 + 8Cl + 5H_2O = Na_2SO_4 + H_2SO_4 + 8HCl$. The acids formed in the neutralization process immediately combine with bases to form neutral salts. Lederer has obtained good results in the elimination of taste in Lake Michigan water treated in this way. Sodium thiosulphate seems to possess marked advantages over sodium sulphite. It must be remembered that the action of the thiosulphate stops the germicidal action of the chlorin so that it is necessary to allow the chlorin to act for a sufficient length of time (Lederer recommends from at least ten to fifteen minutes) before the thiosulphate is added. An interesting point brought out in the discussion of Lederer's paper is that hypochlorite seems under some conditions to accentuate an unpleasant taste originally present in the water. In Toledo, for instance, it is stated that the water develops a disagreeable taste when the river first freezes over, owing to the presence of large amounts of vegetable matter in the water. The bad taste is said to be increased by even small amounts of hypochlorite.—*Jour. A. M. A.*, vol. lxi, No. 16, October 18, 1913, p. 1464.

STUDIES IN CARBOHYDRATES, THE COMPOSITION AND DIGESTIBILITY OF WHEAT BREAD AND ALLIED FOODS, GELATINIZATION OF STARCHES.—In this paper, by Charles H. LaWall, Ph.M., and Sara Graves, B.A., published in Part 2 of the Transactions of the Wagner Free Institute of Science of Philadelphia, are given tabulated observations of the microscopical characteristics of the following starches: Potato, Maranta, Sago, Tapioca, Sweet Potato, Corn, Wheat, Buckwheat, Oat, Rice, Barley, Pea and Bean in the raw state and after having been heated in water to 37°, 80°, and 100° C. respectively, and also after having been subjected to these several temperatures for a period of 30 minutes. Gelatinization points for the various free starches as well as in pastes made from the crushed materials would indicate that in the crushed material the gelatinization points are slightly higher.

Microscopic studies of the starch as found in bread and crackers, notably in Acme, Freihofer, Sharpless, and Jones breads and in Exton, Sunshine, Educator and Uneeda Crackers, Rolls, Pretzels, and Matzoth are tabulated.

Comparisons of the analyses of the several breads and crackers as given would indicate but very slight differences in these products.

From a comparison of the ten tables included in this paper it is apparent that the food values of the various makes of bread and crackers vary only within very narrow limits and that these variations are largely due to temperature differences.

PHILIP F. FACKENTHALL.

PLEADS FOR DRUG USERS.—A plea for the relief of drug victims was made by Dr. Charles A. Towns, of New York, at a legislative hearing in the New York Legislature at Albany on February 25, on bills designed to restrict the sale of habit-forming drugs, principally cocaine and its derivatives. A feature of the proposed laws is a provision designed to treat those who obtain drugs in violation of the law as victims of disease and not as criminals. This provision would give a magistrate authority to commit habitual users of drugs to hospitals or sanatoriums instead of prison.